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ABSTRACT

Very little is known about how companies make decisions about budgets for training. Previous research on employee training has focused on the impact of training on an individual's success in the labor market. Economists have also studied why employers are more likely to train certain persons than others. This study, on the other hand, uses a unique data base on human resource practices in U.S. businesses (the Columbia Business School Human Resources Survey) to study the variation in the training effort across companies. A simple economic model is used to derive several testable hypotheses about the variables that can explain why some businesses invest more in employee training than others. The role of firm characteristics as well as characteristics of the company's industry are studied. The model correctly predicted that large businesses, those with high capital-labor ratios, and those with a high proportion of internal promotions were more likely to have formal training programs. In the case of cost, however, the model performed poorly. Further research is needed to obtain alternative measures of the extent of training and its cost-effectiveness in terms of the organization. (KC)

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UTILIZING CORPORATE SURVEY DATA TO STUDY INVESTMENTS IN EMPLOYEE TRAINING AND DEVELOPMENT

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February 1989

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INTRODUCTION

According to the May 1988 issue of *Training Magazine*, U.S. organizations with fifty or more employees spent $32 billion on formal programs for employee training and development. Although human resource managers argue that training is critical for developing a productive workforce, very little is known about how companies make decisions about budgets for training. Previous research by labor economists on employee training has focused on the impact of training on an individual's success in the labor market, i.e., how training raises the individual's wage and reduces the probability of layoff. Economists have also studied why employers are more likely to train certain individuals than others, and, in particular, have shown that individuals who are expected to stay with the firm are more likely to receive training. Hence, economic research on training has been concerned with the impact of investments in training on the distribution of earnings. Likewise, research on training by industrial and organizational psychologists has been conducted at the individual level, focusing on the impact of training on the employee's cognitive skills, work effort, and morale.

This paper, on the other hand, considers the organization as the unit of observation. Although economic models of training decisions are framed in terms of a company's calculation of the costs and benefits of such training, empirical work has never been able to test this model directly on company performance. Researchers have been forced to make inferences about company performance based on data on the careers of individuals. By utilizing a unique database on human resource practices in U.S. businesses, I am able to study the variation in the training effort across companies. A simple economic model is used to derive several testable hypotheses about the variables that can explain why some businesses invest more in employee training than others. The role of firm characteristics as well as characteristics of the company's industry are studied. The results of this research should prove useful for forecasting how a company's decision to invest in training might be affected by such factors as technological change, government subsidies for training and the extent of competition in the product market.

In the next section of the paper, the literature on employee training is summarized in order to show the types of data available to researchers who have previously studied the topic of employee training. In the third section, I describe the survey I am using, the Columbia Business School Human Resources Survey, and discuss its strengths and weaknesses relative to other databases that have been used for the study of employee training. The fourth section, Determinants of Company Training Programs, specifies a simple model that is tested with the survey data. The final section discusses directions for future research.

LITERATURE REVIEW

In this section of the paper, I summarize the literature that exists on the subject of employee training and development. In preparing this summary, I have reviewed work by economists and industrial psychologists as well as the results of previous surveys of corporate training programs.

Economists

Economists who study on-the-job training have primarily been interested in modelling who receives training and how it affects the individual's growth in earnings over his working life. Examples of this literature are the studies by Mincer (1983, 1987), Brown (1983), Lillard and Tan (1986), Pergamit and Shack-Marquez (1986), Barron, Black and Lowenstein (1987, 1988) and Lynch (1988). These studies use data from national surveys such as the Panel Study of Income Dynamics, the National Longitudinal Surveys (NLS), the Current Population Survey, and the Employment Opportunities Pilot Project. Information on training from the first three data sets is obtained directly from the individuals who are surveyed.

> For example, in the Panel Study of Income Dynamics, which was used by Mincer and Brown, individuals are asked "On a job like yours, how long would it take the average person to become fully qualified?" and "Are you learning skills on the current job which could lead to a better job or promotion?"
>
> The National Longitudinal Surveys, which were used by Mincer, Lillard, and Tan, and Lynch, contain a variety of training questions depending on the particular cohort that was

surveyed. For example, for older NLS cohorts, the training questions are "Do you receive or use additional training (other than schooling training) on your job?" and "What was the longest type of training you have had since the last interview?" For the NLS youth cohort, however, information is provided on all training spells in the respondents' working life; and it is possible to separate company training from apprenticeship training. The individuals in this survey were first interviewed in 1978 when they were between the ages of 14 and 21 and have been re-surveyed every year or two since that time.

The January 1983 Current Population Survey, used by Lillard and Tan, and Pergamit and Shack-Marquez, contains the following question on training: "What training was needed to get the current or last job and what training is needed to improve skills on the current job?"

Finally, the 1980 Employment Opportunities Pilot Project (EEOPP) Dataset, used by Barron et al., is unique in that it surveys employers. The employers were asked to provide information on the amount of on-the-job training provided their most recently hired worker, as measured by the number of hours typically spent by various personnel in training this individual.

The main findings of this research can be summarized briefly: individuals who receive training are likely to be young, white males. Most studies also find that the more educated individuals receive more training than the less educated. Private sector training is found to play a significant role in the wage determination and career patterns of young workers; individuals with more training have significantly larger wage growth and longer job tenure. The data from the EOPP Survey also show that individuals who received more training in their first three months of employment have significantly faster productivity growth during their first two years with the employer.

Industrial Psychologists

Industrial psychologists have studied the effects of employee training utilizing experimental methods and case studies. They have measured the effectiveness of training in one of four ways: (1) subjective learning (judgments of course participants or trainers); (2) objective learning (results on standardized tests); (3) subjective behavior (changes in on-the-job behavior, as perceived by course participants, peers or supervisors); and, least commonly of all, (4) objective results (tangible indicators such as reduced costs, improved quality or quantity of output). An excellent survey of studies conducted by industrial psychologists on the subject of managerial training is provided in Burke and Day (1986). They review seventy articles that evaluated the effectiveness of training programs for managerial or supervisory personnel in various companies. In all of these studies, the individual is the unit of observation and individuals who received training are compared to those who were not in the training program. The comparisons are made on the basis of scores on skill or knowledge tests, performance rankings, ratings during role play, and survey ratings by subordinates. Only a handful of these studies evaluated training programs in terms of objective results. The best example of the latter type of study is the one conducted by Russell, Terborg and Powers (1985) in which 62 retail stores belonging to the same international merchandising organization were the units of observation. They found that sales volume per employee was positively and significantly correlated with the percentage of sales personnel who received training in basic sales procedures and with the sales personnel's perceptions of the emphasis given training in the store.

The main problem with these studies is that each one is limited to a relatively small group of individuals (normally between 50 and 100) in one company so that it is difficult to generalize the findings beyond the company under study. Although Russell et al. examined 62 companies, they are in the same industry and belong to the same organization. In her critique of the psychological research, Ingols (1987) accuses the researchers of minimal cross-referencing: "They do not look for common themes across companies, but focus on the specific case at hand." She concludes that this line of research has left us with a limited and fragmented knowledge about the role of training in corporations.

Surveys of Corporate Training Programs

Information on investments in employee training can also be obtained from surveys that are conducted by various organizations. For example, each year, Lakewood Research, a division of Lakewood Publications, the publisher of *Training Magazine*, conducts a survey of U.S. organizations with 50 or more employees. Respondents are asked for information on the amount their organization budgets for formal training, the number of individuals who receive training during the year, and the number of hours of training they receive. The information from approximately 2,400 respondents is extrapolated by Lakewood Research to a universe of 230,000 organizations and reported in aggregate figures only. For example, the results of the 1987 survey, published in May 1988, indicate that $32 billion was budgeted for formal training that year with 38.8 million workers scheduled to receive 1.2 billion hours of training. The survey also described the types of training (e.g. management skills, technical skills, clerical skills, sales skills, etc.) provided by the respondent companies and showed how these differ across industries and size of firm.

A second example of a corporate survey is the study prepared by The Conference Board in 1975 (Lusterman, 1977). It surveyed 2800 companies that had at least 500 employees and received usable responses from 610 firms. These data were then extrapolated to the universe of 7600 firms. Information on per employee expenditures for formal in-house training, tuition aid and other outside training was obtained. The main findings of this study were that the companies spent an average of $60 per employee on the three types of training, $48 of which was spent on formal in-house training; large companies spent more per employee than small companies; and the share of the training budget attributed to formal in-house training rose from 47% for the firms in the smallest size category to 87% for the firms in the largest size category. Converting the 1975 expenditures to 1987 dollars would produce an expenditure of $93 per employee on formal in-house training.

In 1985, The Conference Board surveyed 218 companies to obtain information on changes in corporate education and training that had occurred in the previous five years (Lusterman, 1985). While this new report did not contain any cost information, it discussed how the training function had increased in importance at the surveyed companies. A larger proportion of employees in all major job categories were involved each year in formal training as compared to five years earlier. The companies reported that they were strengthening and widening the role of corporate training departments and were using more sophisticated methods to evaluate the need for and to assess the impact of employee training.

A third example of a corporate survey is the one conducted by the Battelle Human Affairs Research Center in 1987 (Saari, Johnson, McLaughlin, and Zimmerle, 1988). This group mailed a questionnaire to 100 U.S. companies randomly selected from all private-for-profit companies having at least 1,000 employees. While the response rate was excellent (61%), the survey collected data only on management training. The information is in the form of categorical variables such as the company's use of formal on-the-job training, mentoring, job-rotation, training needs assessment, and training evaluation systems. The survey also collected information on the reasons companies give for selecting various training program approaches (e.g. external vs. internal), and the process used to select participants for these programs. The major finding from this survey is that 89% of the companies reported using formal training/education programs, with usage of this training positively correlated with company size. In spite of the prevalence of formal training, there was limited evidence of systematic evaluations of management training by the companies in this sample.

General Observations

As this literature review has revealed, what we know about employee training is the following:

> it has positive career impacts on the individuals who receive it;
> that U.S. companies spend a fair amount on formal training; and
> many case studies conclude that employee training is effective in improving job performance.

What is lacking, however, is a clear understanding of why some companies invest heavily in employee training and others do not. To date, no one has been able to study the variation in training across businesses and to describe the factors that determine that variation; with the exception of the EOPP survey, the focus has

always been on variation in training across individuals. It is the purpose of the current research to shift the focus of analysis to the company that is making the training decision.

THE COLUMBIA BUSINESS SCHOOL HUMAN RESOURCES SURVEY

In 1987, the Industrial Relations Research Center of the Columbia Business School conducted a survey of human resources policies and practices in American businesses. A questionnaire was sent to the executives responsible for 7,765 business units during the time period covering Fall 1986 through Spring 1987. The name and address of the executive in charge of each unit was obtained from the Compustat data files.

Response rate. Responses were received from 854 business units (11 percent response rate), although useable data were received from only 493 business units (6.4 percent overall response rate). Although this response rate is low, it is not substantially different from the response rates obtained by analysts who conducted much less comprehensive surveys of organizations' Human Resource Management (HRM) policies (for example, see Hitt & Ireland, 1986). The businesses in the Columbia survey are smaller than those used in the Battelle survey discussed above. Fifty-percent of our businesses have fewer than 900 employees; twenty-five percent have fewer than 240 employees. The Battelle survey only included businesses with at least 1,000 employees and this may, in part, explain why their response rate was so high, we did indeed have a better response rate from larger business units. Responding business units tended to be larger than nonrespondents and they reported significantly higher sales, operating income, capital expenditures, assets, and equity than nonrespondents. The industrial distributions of the two groups were very similar.

Data collected. The survey instrument sent to COMPUSTAT business units elicited detailed data pertaining to 1986 on organizations' HRM policies and practices covering various occupational groups: (1) managers; (2) unionized and (3) nonunion professional and technical workers; (4) unionized and (5) nonunion clerical workers; and (6) unionized and (7) nonunion manufacturing and production workers. Information on training and development; selection, evaluation, and compensation policies; and communication and employee involvement policies was obtained for each of these groups. In addition, the business units provided information about their overall human resource planning.

The data from the human resources survey have been merged with the data on the COMPUSTAT files. Hence, for each of the business units in the survey, we have information on capital expenditures, value of assets, operating income, research and development expenditures, and net sales. Demographic characteristics of the business's employees are proxied by the characteristics of the employees in the organization's industry and geographic labor market, as reported in the Current Population Survey data. In addition, for the business units in the manufacturing sector, we have information on the following attributes of the business unit's four-digit SIC category: concentration ratio, value of exports, value of imports, value of the capital stock, value of inventories, value of shipments, total factor productivity, energy expenditures, and number of employees. Data on these variables are available for the time period 1958-1984 inclusive.

On the subject of employee training and development, the survey asks several questions as they pertain to each of the seven occupational groups. The questions for each of these groups are:

(1) Does your business have a formal employee training and development program?

(2) If yes, when was the program instituted?

(3) If yes, who participates in decisions about the types of training and development program undertaken by your business?

(4) What was the approximate cost of formal training and development programs per employee in your business last year?

(5) What indicators are used to assess employee training and development (e.g., employee opinions, productivity on the job, cost-benefit analysis)?

While our response rate is low relative to those of the surveys of corporate training programs discussed in the previous section, our survey clearly surpasses the others in terms of the wealth of detail that is available on the company's human resource policies and economic characteristics. As I show in the next section of the paper, these data are critical elements of a model of corporate investments in employee training. The earlier studies that utilized corporate surveys were not concerned with hypothesis testing regarding variation in the training effort across businesses and, hence, could conduct a less intensive data collection effort while concentrating on maximizing sample size. The Columbia Business School Survey took an alternative approach, namely, the need to collect a large amount of information from each respondent in order to be able to systematically study how and why human resource policies and practices differ across American businesses.

Results

Table 1 reports mean values for training questions (1), (3), and (4) above for each of the seven occupational groups. Formal training programs are used in one-third to one-half of the businesses in our sample, depending on the occupational group under study. These training programs have been in existence longer for unionized employees than for nonunionized workers. Unfortunately, data on the cost of formal training per employee were reported by only a small percentage of the businesses in the sample. However, these data can be utilized to make a rough estimate of the total amount that the average business spent on training. Assuming that it had the average number of employees in each employee category, the average business would have spent about $5.5 million on training in 1986. Multiplying this figure by the number of businesses in the COMPUSTAT files (including those without useable names and addresses for executives) would result in a total expenditure of $55 billion for 1986.

Table 2 provides information on the prevalence of formal training programs across industry categories. A training index is defined as the sum of the responses to the questions regarding the presence of a formal training program for the seven occupational categories divided by the sum of seven dummy variables indicating the presence of employees in each of the seven occupational categories. As Table 2 shows, the mean value of the training index is .412, with a low of .083 in the entertainment services industry and a high of .635 in the transportation industry. We also see that retail trade and the finance and insurance industry have above average values for the training index.

As the data in Table 1 indicated, many companies with formal training programs did not respond to the question regarding the cost of formal training per employee. Since this variable is particularly important for measuring variation in training intensity across business, we need to explore why some businesses answered this question and others did not. In particular, the existence of selectivity bias must be considered. Table 3, where the businesses are divided into four quartiles based on number of employees, provides more detail on this issue by showing how the response rate varied across occupation groups and across size categories. Each entry in Table 3 shows, for each occupation, the percentage of businesses with a formal training program that reported cost of training for that program. The entries in parentheses show the percentage of businesses with formal training programs for that occupation. The data show no clear pattern. While the response rate initially rises with size, it falls off for the very large businesses. Although these large organizations are most likely to have formal training programs, they either do not have, or choose not to report, information on the cost of training. The entries in Table 3 are highly correlated *across* occupations. In other words, if a company reports training costs for one occupation, it reports it for the others as well. Indeed, the correlations across occupations are all above .75, and, in many cases, exceed .9. This suggests that firm characteristics aside from size may be important in explaining the response rate.

To test this hypothesis, I estimated a binary logit model on the subset of firms that reported having a formal training program for the particular occupation under study; the dependent variable equals one if the businesses reported cost of training information, and equals zero if it did not (see Table 4). Three categories of variables are used. The first describes the economic characteristics of the business unit and includes SIZE--the number of employees; ROA--return on assets, calculated as the ratio of net income to identifiable assets; and CAPLAB--the capital-labor ratio, calculated as the ratio of capital expenditures to the number of employees. The second category describes the business's human resource policies and includes YRPGM--the

year in which the training program was instituted; and POLICY--an index measuring the degree of sophistication of the business unit's human resource policies.[1] The third category is a set of industry dummies where the excluded category is finance, insurance and real estate.[2] The binary logit results are shown in Table 4 for managers and the three nonunion occupations; sample sizes were too small for the unionized occupational categories. There is no evidence in Table 4 of any systematic relationship between the business's economic characteristics and the probability of reporting training cost information; neither SIZE nor ROA ha significant effects and CAPLAB is significant in only one equation. Businesses with more sophisticated human resource policies are not more likely to report cost information, and in one case, are even less likely to report it. The year the training program was instituted is significant in only one case. Finally, the industry variables appear to be the most important in this table. For example, businesses in the retail industry and in the business services industry are more likely to report cost information than those in the finance and insurance industry.

DETERMINANTS OF COMPANY RAINING PROGRAMS

In this section of the paper, I show how a simple model can be specified and estimated to explain the observed variation in the presence of formal employee training programs across the businesses in our sample. Since the purpose of this paper is not to provide a rigorous econometric analysis of corporate training activities but rather to provide a new direction for research on training, this analysis is necessarily preliminary, but suggestive of the way in which corporate survey data can be used.

A Basic Framework

Using the assumption that the businesses in our sample are profit-maximizers, we can derive several testable hypotheses about the determinants of company training expenditures. The company's profits are defined as gross sales minus wages, training expenditures, and all other expenditures on inputs:

$$(1) \qquad \Pi = P_x X - wL - tL - rK$$

where P = the price of the product X, X = the quantity of output produced, w = the wage rate, L = the quantity of labor utilized, t = training expenditures per unit of labor, K = a composite index of all other factors of production, and r = the per unit cost of this composite index.

Maximizing Π with respect to t, training expenditures per unit of labor, results in the following condition:

$$(2) \qquad \frac{\partial}{\partial t}\left(\frac{X}{L}\right) P_x = 1$$

which simply states that the business will choose that level of t where the marginal return from an additional dollar spent per worker on training just equals its marginal cost. According to the left-hand side of equation (2), the marginal return from an additional dollar spent per worker will be higher in those businesses where the average product of labor is more sensitive to investments in training. Equation (1) can be modified to

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[1] The index is defined as follows. The organization receives one point for each yes answer to the following questions: (1) Does the organization have a formal written HRM plan? Does the organization formally evaluate policies developed in the following HRM areas: (2) Work organization and job design? (3) Employee selection and staffing? (4) Employee training and development? (5) Communication and participation programs? (6) Performance appraisal? (7) Compensation? (8) Union-management relations? (9) Employee relations?

[2] The industry variables are NONDUR--nondurable manufacturing, DUR--durable manufacturing, TRANSP--transportation, WHTRADE--wholesale trade, RETAIL--retail trade, BUSSERV--business and repair services and PERSERV--personal services.

describe the company's maximization problem as one of maximizing the discounted flow of future profits. In this case, the marginal return on a current expenditure on training will equal the discounted sum of increases in the average product of labor over the expected working life (T) of the company's employees:

$$(3) \quad \sum_{i=1}^{T} \frac{\partial}{\partial t} (X)_{L\,i} \; P_i = 1$$

We can derive several hypotheses about the variation in per worker training expenditures across businesses by considering which factors are likely to lead to a greater sensitivity of the average product of labor to training expenditures. First is the degree of technological change in the firm. Companies that are introducing new technology need higher levels of human capital in order to implement the technology and reap its benefits.

At certain stages in the change process they meet this need by increasing their training. The productivity of labor in this type of company will be more sensitive to training because the potential for learning is greater. A second variable to study is the average tenure of the workers in the company. As equation (3) indicates, the payoff from training is higher in those companies where employees are likely to stay longer. Third, the role of company size needs to be considered. As the literature review indicated, previous surveys have shown that large companies spend more per employee on formal training than small companies. If tenure is longer, on average, in large companies than small ones, this could explain the role of size. If this is not the case, then, according to equation (2), the only way to explain the role of size is to argue that labor productivity is more sensitive to training in large firms than in small ones. There are two possible explanations. The first is based on the argument that it is more difficult to monitor worker productivity in large firms. According to this view, training is more critical in large firms than small firms, because workers are more likely to shirk there. A second explanation relies on the notion of public goods. Instead of expressing training expenditures as the product of per worker expenditures and the number of workers, we could simply write total training expenditures, T. Then the marginal return from an additional dollar spent on T will be greater in large firms because a one dollar increase in T will increase the productivity of all workers. While this is a somewhat extreme case, it is consistent with a perhaps more realistic notion that there are "economies of scale" in the provision of training; one supervisor can teach a class of trainees and each trainee could learn as much as he would have in a private training session. Finally, product competition should play a role in the firm's calculation of the returns to training. For example, a company that is facing tough competition from domestic competitors or from foreign companies may increase its investments in employee training as a way of improving product quality and lowering production cost.

Empirical Specification

The hypotheses discussed above are tested on the survey data using two dependent variables: (1) a binary variable that equals one if the business has a formal training and development program, and zero otherwise; and (2) the per worker expenditure on formal employee training and development. Each of these variables is measured separately for the seven occupation groups, and then a composite index is created for the business as a whole. The independent variables are measured as follows.

First, the degree of technological change in the business is measured in several ways. I use the ratio of R&D expenditures to sales (RDRATIO) and the ratio of capital expenditures to the number of employees in the business (CAPLAB). These two variables are calculated from the COMPUSTAT files. The third way in which the degree of technological change is measured is based on the response to the following survey question: "Is your organization currently using automation (through greater use of personal computers) as a strategy to improve your position in the marketplace?" Respondents used a scale of one to five to indicate how important this strategy was for their organization (AUTOMATE). The size of the business is obtained directly from the survey responses to the questions regarding number of workers in each occupational category (SIZE). When this was unavailable, information on the number of employees was obtained from the COMPUSTAT files. The average tenure of employees in the business was not available on the survey, but was proxied by the response to the following question: "To the best of your knowledge, about

what percentage of your nonentry level jobs have been filled from internal sources in recent years? This variable (INTPROM) should be highly correlated with average tenure, since businesses that rely on internal promotions will have long tenure employees compared to businesses that hire from the outside. The variation in the extent to which the businesses screen job candidates may also play a role in the decision to train. Presumably, organizations that benefit from trained workers will screen applicants more carefully in order to reduce training costs. A variable measuring whether or not job candidates are required to take a written or other formal test of skill (SCREEN) is used and is expected to be positively correlated with training.

Information on product competition is only available for the businesses in the manufacturing sector and refers to the four-digit SIC category of which the business is a member. Hence, these variables are not specific to the business itself and can only serve as a rough proxy for the business's true characteristics. The first, the concentration ratio in the industry (CRATIO), is a measure of the extent of domestic competition. There are two problems with this variable. First, the latest date for which it is available is 1982, and, second, it can be argued that even in industries with high concentration ratios, the degree of competition between the leaders in the industry can be very intense. The second variable, the ratio of the value of imports in the industry to the value of shipments (IMPRATIO), is used to measure the degree of foreign competition that the domestic firms face.

Results

Table 5 contains the results of estimating a binary logit model where the dependent variable equals one if the business reported that it had a formal training and development program for the particular occupational group under study, and zero otherwise. The predictions of the model are generally confirmed. The three indicators of technological change, LCAPLAB, RDRATIO, and AUTOMATE, are always positive, but only LCAPLAB is significant. The size of the business, LSIZE, is always positive and is significant in six of the seven equations. Unfortunately, whether this is due to the "shirking" problem or to economies of scale in the provision of training cannot be determined. The proxy for average tenure of employees, INTPROM, the proportion of nonentry jobs that are filled through internal sources, is positive and significant for all employee groups except clericals. This could reflect the reduced importance of specific training for this group. Finally, SCREEN is positive in all equations and significant in six of them. There appears to be a positive correlation between training and intensity of screening.[3]

In Table 6, the training index, defined as the sum of the responses to the questions on the presence of training programs for the seven occupational groups divided by the sum of seven binary variables on the presence of these occupations, is used as the dependent variable. The advantage of this variable is that all of the businesses can be included in the equation. The results in Column (1) show that the three indicators of technological change are positive. Although LCAPLAB is still the only one that is significant, the effects of RDRATIO and AUTOMATE on the training index are reasonably close to significance. The weak effects in the disaggregated analyses become stronger when the groups are merged. The other variables, LSIZE, SCREEN, and INTPROM remain positive and significant in this framework. Columns (2) and (3) show the results of estimating the training index equation on the sample of businesses in the manufacturing industry. The main difference here is that LCAPLAB is no longer significant.[4] The two product market variables are tried alternatively in columns (2) and (3) but neither is significant.

Finally, Table 7 reports the results of estimating equations on the per worker cost of formal training programs. As can be seen, the samples are extremely small here, and were even smaller for the excluded occupation groups. In column (5), the dependent variable is a training cost index which is an average of the responses to the four training cost questions. The results in this table are very weak and indicate that training cost data of the type collected in the Columbia Business School Survey may be very unreliable. The fact that the predictions of the model were borne out for the binary dependent variable but not for the cost

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[3] Barron, et al. (1988) observed the same result in their analysis of the EOPP data set.

[4] This is not because of the inclusion of CRATIO or IMPRATIO. When the column (1) specification was estimated for the manufacturing businesses, LCAPLAB was not significant.

variable indicates that the businesses in our sample may have been unable to calculate accurately the costs of formal training.

SUMMARY AND DIRECTIONS FOR FURTHER RESEARCH

This paper has argued the importance of utilizing corporate survey data to study investments in employee training and development. The review of previous research showed that most studies of training rely on data provided by individuals and therefore focus on the variation in training across individuals and its impacts on their career advancement. Although economic models of training decisions are framed in terms of a company's calculation of the costs and benefits of such training, empirical work has never been able to test this model directly on company behavior. The data collected from prior surveys of corporate training have not been suitable for hypothesis testing because these surveys neglected to obtain information on economic characteristics that are important elements of a model of employee training.

The Columbia Business School Human Resources Survey is much better suited to an analysis of the variation in training across U.S. businesses. It has the significant advantage of providing the researcher with detailed information on the company's human resource policies and its economic characteristics as was shown above in Determinants of Company Training Programs, this type of information is essential for hypothesis testing regarding the factors that explain why some companies are more likely to invest in training than others. On the subject of employee training, the survey collected information on (1) whether or not the business had a formal employee training and development program; and (2) the approximate cost of formal training and development programs per employee in the year prior to the survey. The results from the survey show that businesses will respond to question (1), but only 40% of those businesses with a formal training program responded to the cost question. My analysis of the determinants of responding showed that there was no clear pattern; the probability of responding was not significantly correlated with any economic characteristics or human resource policies of the business units.

The econometric analysis of the determinants of the variation in training across businesses showed that the predictions of the behavioral model were supported when the binary dependent variable was utilized. For example, large businesses, those with high capital-labor ratios, and those with a high proportion of internal promotions were more likely to have formal training programs. In the case of the cost measure, however, the model performed poorly. This, in conjunction with the low response rate for the cost question, suggests that the cost question may not be suitable for obtaining information on the training effort in U.S. businesses. Indeed, this analysis has already led to our making plans to conduct a follow-up survey of respondents in order to obtain alternative measures of the extent of training. We plan to experiment with questions regarding the number of hours spent by various personnel in training a newly hired worker as well as the number of months that elapse between the date of hire and the date at which the individual is considered "fully trained."

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TABLE 1
TRAINING PROGRAMS AND TRAINING EXPENDITURES

Variable	Managers	Professional/ Technical Employees		Clerical Employees		Manufacturing/ Production Employees	
		Union	Nonunion	Union	Nonunion	Union	Nonunion
Percent With a Formal Training Program	49.2% (488)	47.3% (55)	45.1% (468)	37.7% (85)	32.9% (474)	47.5% (162)	40.6% (323)
Mean Age of Program in Years	12 (222)	22 (21)	13 (188)	20 (26)	14 (143)	20 (62)	12 (115)
Mean Cost of Training Per Employee	$1,343 (101)	$1,037 (3)	$1,408 (84)	$873 (6)	$368 (70)	$470 (26)	$359 (49)
Total Cost of Training Per Business	$1,164,821 (89)	N.A.	$2,108,745 (74)	N.A.	$229,513 (62)	$706,526 (23)	$1,299,167 (42)

Note: The sample size is in parentheses.
* Calculated by multiplying the training cost per employee by the number of employees in the occupational category.

TABLE 2
MEAN VALUE OF TRAINING INDEX, BY INDUSTRY

Industry	Training Index
1. All (N = 491)	.412
2. Mining (N = 28)	.200
3. Construction (N = 3)	.167
4. Nondurable Manuf. (N = 70)	.463
5. Durable Manuf. (N = 154)	.254
6. Transportation (N = 83)	.635
7. Wholesale Trade (N = 10)	.242
8. Retail Trade (N = 27)	.536
9. Finance, Ins., Real Estate (N = 59)	.531
10. Business & Repair Services (N = 34)	.480
11. Personal Services (N = 8)	.217
12. Entertainment Services (N = 5)	.083
13. Professional Services (N = 10)	.467

Training Index =

$$\frac{\sum_{i=1}^{7} \text{Dummy Variable for Presence of Training Program for Occupation } i}{\sum_{i=1}^{7} \text{Dummy Variable for Presence of Workers in Occupation } i}$$

TABLE 3
PERCENTAGE OF BUSINESSES WITH FORMAL TRAINING PROGRAMS THAT REPORTED COST OF TRAINING, BY SIZE QUARTILE

	SIZE 1 (2-241)	SIZE 2 (242-898)	SIZE 3 (899-3900)	SIZE 4 (3901-316900)
1. Managers	.386 (35.8)	.386 (39.6)	.413 (56.3)	.337 (76.9)
2. Unionized Professional/ Technical	0.0 (28.6)	0.0 (27.3)	.333 (50.0)	.063 (66.6)
3. Nonunionized Professional/ Technical	.328 (38.2)	.368 (35.5)	.400 (51.9)	.343 (63.8)
4. Unionized Clerical	0.0 (16.7)	0.0 (0.0)	.375 (38.1)	.091 (61.1)
5. Nonunionized Clerical	.395 (24.7)	.371 (32.1)	.413 (42.2)	.291 (51.9)
6. Unionized Manufacturing/ Production	.111 (58.1)	.333 (46.2)	.400 (39.2)	.270 (62.7)
7. Nonunionized Manufacturing/ Production	.378 (33.6)	.357 (37.3)	.313 (42.1)	.244 (59.4)

Note: Numbers in parentheses show the proportion of businesses with formal training programs.

TABLE 4
PROBABILITY OF REPORTING COST OF TRAINING
GIVEN THAT FORMAL TRAINING PROGRAM EXISTS

	Managers	Nonunion Prof/Tech	Nonunion Clerical	Nonunion Mfg/Prod
SIZE	-.128 (-1.45)	-.038 (-.41)	-.025 (-.26)	-.298 (-1.27)
ROA	.604 (1.24)	1.07 (1.41)	.55 (.75)	1.95 (1.02)
CAPLAB	-4.82 (-.98)	-5.52 (-.83)	-3.56 (-.72)	40.48 (1.86)
YRPGM	-.01 (-.32)	.002 (.13)	-.01 (-.68)	-.05 (-2.05)
POLICY	-.014 (-.32)	-.03 (-.64)	-.01 (-.15)	-.15 (-2.19)
NONDUR	.198 (.34)	-.40 (-.65)	-.80 (-.96)	1.58 (.82)
DUR	.785 (1.49)	-.01 (-.11)	— —	2.19 (1.18)
TRANSP	1.30 (2.49)	.53 (.94)	.73 (1.41)	.89 (.47)
WHTRADE	.93 (.63)	— —	— —	— —
RETAIL	1.54 (2.38)	1.15 (1.32)	1.36 (1.78)	3.73 (1.87)
BUSSERV	1.05 (1.67)	1.11 (1.63)	1.99 (2.57)	.45 (.21)
PERSERV	2.19 (1.57)	— —	— —	— —
Constant	-.55 (-.44)	-.70 (-.55)	-.136 (-.09)	1.08 (.57)
N	186	155	121	102

TABLE 5
BINARY LOGIT MODELS OF PRESENCE OF FORMAL TRAINING PROGRAM

Independent Variable	Managers (N = 347)	Professional/Technical Employees		Clerical Employees		Manufacturing/ Employees	
		Union (N = 43)	Nonunion (N = 330)	Union (N = 67)	Nonunion (N = 344)	Union (N = 122)	Nonunion (N = 233)
LSIZE	.34	.95	.16	.51	.25	.06	.18
	(4.94)	(2.06)	(2.33)	(2.37)	(3.63)	(.48)	(2.35)
LCAPLAB	.14	1.43	.18	.53	.20	.15	.18
	(2.15)	(2.39)	(2.64)	(2.27)	(2.90)	(.99)	(1.95)
RDRATIO	.64	47.30	.64	73.53	1.11	4.16	.48
	(.84)	(.18)	(.84)	(.45)	(1.45)	(.18)	(.62)
SCREEN	.99	4.69	1.33	.81	.96	2.04	1.22
	(2.77)	(2.53)	(4.37)	(1.05)	(3.31)	(3.96)	(3.85)
INTPROM	.01	.03	.01	.00	.00	.02	.01
	(2.78)	(1.71)	(3.21)	(.03)	(.24)	(2.77)	(2.59)
AUTOMATE	.12	.77	.15	.72	.13	.35	-.25
	(1.02)	(1.02)	(1.23)	(1.75)	(1.04)	(1.42)	(-1.65)
Constant	-2.87	-8.12	-2.06	-5.81	-2.75	-3.63	-1.14
	(-4.26)	(-1.80)	(-2.98)	(-2.35)	(-3.74)	(-2.48)	(-1.29)

TABLE 6
DEPENDENT VARIABLE: TRAINING INDEX

Independent Variable	(1) (N = 392)	(2) (N = 153)	(3) (N = 151)
LSIZE	.040 (3.88)	.037 (2.23)	.036 (2.13)
LCAPLAB	.037 (3.51)	.024 (1.23)	.019 (.97)
RDRATIO	.179 (1.34)	.076 (.51)	.089 (.60)
SCREEN	.468 (7.43)	.494 (4.99)	.481 (4.81)
INTPROM	.002 (2.47)	.003 (2.33)	.003 (2.52)
AUTOMATE	.024 (1.29)	.043 (1.52)	.044 (1.53)
CRATIO	–	-.001 (-.47)	–
IMPRATIO	–	–	.015 (.12)
Constant	-.02 (-.15)	-.23 (-1.23)	-.30 (-1.58)
R^2	.23	.29	.29

Note: In Columns (2) and (3), the regressions include only businesses in the manufacturing sector.

TABLE 7
DEPENDENT VARIABLE:
PER WORKER COST OF FORMAL TRAINING PROGRAM

	(1) Managers (N = 78)	(2) Nonunion Professional/ Technical Employees (N = 62)	(3) Nonunion Clerical Employees (N = 54)	(4) Nonunion Manufacturing/ Production Employees (N = 39)	(5) Training Cost Index (N = 99)
LSIZE	106.11 (.43)	195.90 (.62)	150.60 (2.08)	177.96 (2.45)	75.19 (.53)
LCAPLAB	101.51 (.42)	285.40 (.87)	107.18 (1.42)	126.78 (1.84)	157.91 (1.09)
RDRATIO	-1765.72 (-.40)	-853.97 (-.17)	92.28 (.09)	34.68 (.04)	-783.85 (-.29)
SCREEN	-67.85 (-.05)	2651.67 (2.09)	183.44 (.63)	24.55 (.10)	704.77 (.85)
INTPROM	-3.72 (-.24)	-11.07 (-.58)	07.27 (-1.69)	1.24 (.32)	-8.16 (-.80)
AUTOMATE	306.20 (.63)	58.09 (.09)	-36.22 (-.26)	-.50 (-.00)	113.93 (.44)
Constant	385.12 (.13)	1241.39 (.35)	302.97 (.34)	-301.14 (-.38)	838.13 (.50)
R^2	.02	.10	.15	.23	.04